

Facilitating Discussions for Mathematics Learning

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"When we ask good questions in math class, we invite our students to think, to understand, and to share a mathematical journey with their classmates and teachers alike. Students are no longer passive receivers of information when asked questions that challenge their understandings and convictions about mathematics. They become active and engaged in the construction of their own mathematical understanding and knowledge."

From *Good Questions for Math Teaching*
by Schuster and Anderson

Take a moment...

Think about an ideal classroom discussion.

- What are some of the characteristics?
- What is the teacher doing?
- What are the students doing?
- Do you have these discussions in your classroom?

Why is discussion important?

- ❖ Talk can reveal understandings and misunderstandings
- ❖ Talk supports robust learning by boosting memory
- ❖ Talk supports deeper reasoning
- ❖ Talk supports language development
- ❖ Talk supports development of social skills

Supports Social Skills



Rights and Obligations

Every person has the *right* to:

- Make a contribution to an attentive audience
- Ask questions
- Be treated civilly
- Have his/her *ideas* discussed, not him/her.

Every person has the *obligation* to:

- Speak loudly enough for others to hear
- Listen for understanding
- Treat others civilly at all times
- Consider others' ideas, then explain agreement or disagreement

Supports Language Development



“Talk Moves”

1) Revoicing: Teacher

“revoices” for 2) Repeating: Student repeats another student’s

3) Reasoning: Student

explains their 4) Adding on: Student adds a comment on to another student’s comment.

5) Wait time...(tick tock)

Video 1.3a6

- How did you know that $\frac{7}{8}$ is greater than $\frac{3}{4}$?
- Notice the environment that has been established in this classroom.

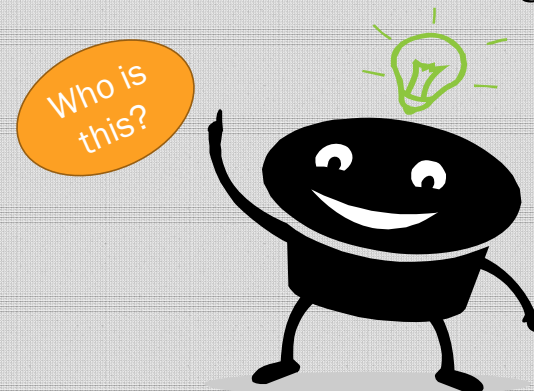
Video

- Is forty a factor of forty? 1.1d
- While you are watching, try to write down some of the talk moves the teacher uses to support language development.
- What was the outcome of the discussion?

Supports Robust Learning and Deeper Reasoning

- 1) Make sense of problems and persevere in solving them.
- 2) Reason abstractly and quantitatively
- 3) Construct viable arguments and critique the reasoning of others
- 4) Model with mathematics
- 5) Use appropriate tools strategically
- 6) Attend to precision
- 7) Look for and make use of structure
- 8) Look for and express regularity in repeated reasoning.

Reveals Understandings and Misunderstandings



When do I use it?

- Error analysis
- Introduction of a new concept or definition
- To investigate misunderstandings
- To compare multiple strategies
- To evaluate an open-ended question

Have you ever...

- Taught a lesson on the commutative property of multiplication?
- How did you teach that lesson?
- Was it successful? Why or why not?

Does the order of numbers in a multiplication sentence affect the answer? Why or why not?

- Mrs. S: Ok, Rebecca, do you agree or disagree with what Eddie is saying?
- Rebecca: Well, I agree that it doesn't matter which number is first, because two times five equals five times two. But I don't get what Eddie means about the multiplication meaning different things.

- Mrs. S: Eddie, would you explain what you mean?
- Eddie: Well, I just think that the two times five that Rebecca used can mean two groups of five things like two bags of five apples. And the five times two means five bags of two apples. Those aren't the same at all.
- Tiffany: But you still have the same number of apples! So they do mean the same!
- Mrs. S: Ok, so we have two different ideas here to talk about. Eddie says that order does matter, because five times two and two times five can each be used to describe a different situation, like two bags of five apples or five bags of two apples.

- o Mrs. S: So the two number sentences mean different things. And Tiffany, are you saying that those two number sentences *can't* be used to describe two different situations?
- o Tiffany: No, I mean that even though the two situations are different, the answer is the same.
- o Mrs. S: Ok, so you're saying that the order doesn't matter because the answer is the same?
- o Tiffany: Right.
- o Mrs. S: Ok. We need to think about this. In Eddie's statement, order makes a difference in the situation you're describing. In Tiffany's statement, order doesn't make a difference in the answer we get. So when does order make a difference in multiplying two numbers together?

An excerpt from "Classroom Discussions"

- o How did the teacher begin the discussion?
- o What do you think about this approach to the lesson?
- o What did the students get out of the lesson?

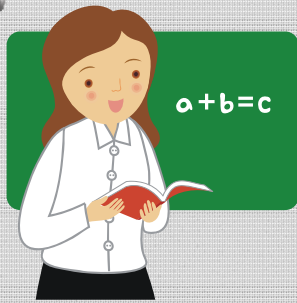
But, I don't know what questions to ask...

The questions you ask will determine what your students get out of the discussion.

What makes a good question?

You choose!

- o What is the slope of this line?
- o How can I find the y-intercept?
- o How do you add two fractions?
- o What is the product?
- o Is the greatest common factor 12 or 18?
- o Why is 10 the lowest common denominator?



Don't ask...
What questions do I
ask?

Ask...
What do I want this question
to *do*?

Categories of questions:

Category A—*Questions that elicit information:*

These questions draw out what is already known in terms of both information and experience and establish appropriate procedures for the conduct of the work.

Category B—*Questions that shape understanding:*

These questions help teachers and students fill what lies between the facts and sort out, express, and elaborate how they are thinking and feeling about the material.

Category C—*Questions that press for reflection:*

These questions demand intellectual and emotional commitment by challenging the individual to think critically and creatively.

Sort...

- What is the slope of this line?
- How can I find the y-intercept?
- How do you add two fractions?
- What is the product?
- Is the greatest common factor 12 or 18?
- Why is 10 the lowest common denominator?

Thanks for coming!

- What is your take-away from today?
- What questions do you still have?
- What can you do immediately to bring talk into your classroom?

References

- *Classroom Discussions: Using math talk to help students learn* by Chapin, O'Conner and Anderson.
- *Good Questions for Math Teaching: Why ask them and what to ask* by Schuster and Anderson
- *Asking Better Questions*, Norah Morgan and Juliana Saxton
- *Questioning Your Way to the Standards*, Dennis S. Mewborn and Patricia D. Huberty (1999)